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(54) IMPROVEMENTS IN EARTH MOVERS

(71) We, KARL SCHAEFF K.G. MASCHINENFABRIK, of 7183 Langenburg, Württemberg, Germany, a German Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to an earth-mover of the kind (hereinafter called "the kind referred to") consisting of an engine-powered vehicle with at least two axles, a front implement (e.g. a loading scoop or grading or levelling device) attached by linkage at the front end of the vehicle, and an excavator mounted slubly at the rear end of the vehicle.

In view of the excavating and loading or levelling operations which on nearly all construction sites follow one another in short periods of time, it is known for the full utilisation or keeping small of the parked implement storage to build deep shovel excavators at the rear on to conventional scoop loaders (front loaders). As in a front loader the driving engine including driving gears, distributor gears and hydraulic pumps is usually arranged towards the rear and extending over the rear axle. In the case of the additional building-on of a rear deep shovel excavator there arises a very unfavourable distribution of the weight. Therefore, to obviate tipping-over of the vehicle during transportation, the locking of the rear axle against swinging is necessary. A further disadvantage with front loaders subsequently complemented for multi-purpose use resides in that the built-on excavators have only a limited sluing range of about 180° and that for the excavation operations transverse to the direction of travel there is no counter-weight for disposal so that then one can dare to exert the scraping forces only within limits. Moreover it is very inconvenient for the operator to change over to a rear seat from his and front driving seat over the engine, particularly during ditch or trench excavation when repeatedly the vehicle must be driven forward through a short distance after a short period of excavation.

There are also known tractors, derived from agricultural towing vehicles, which are fitted with sluably-arranged loading scoops above the front axles and at the rear thereof deep shovel excavators can be built on. In this form of tractor, on account of the loading scoop arranged above the front steering axle, there arise loading and levelling characteristics worse than those in a vehicle particularly designed therefor. As these tractors are constructed initially as haulage vehicles, usually there is provided only a one-axle drive with over-dimensioned rear driving wheels and small front wheels, from which there results a bad distribution of axle loading when such a vehicle is used for loading or excavating. Moreover, with this construction, if furnished with a built-on rear sluable excavator, there are also the above-indicated disadvantages of the limited excavator sluing range, of the absence of an adequate counterweight during excavator operations transverse to the direction of travel, and of the impracticable changing-over of the driver from one control arrangement for travelling to the other control arrangement for the excavator.

It is therefore desirable to provide an earth mover of the kind referred to with obviation of the indicated disadvantages to an extent such that both for the action of the loading scoop or other implement at the front as well as for that of the excavator at the rear there are provided optimum conditions with respect to the supporting and absorbing of the working forces and of the distribution of the loads and weight, and in particular with regard to the operation of the excavating implements there is rendered possible a greater sluability and over the whole sluing range a complete action of forces remaining constant. Thereby at the same time the changing-over of the operator from one seat to another is to be substantially simplified, or it may be totally avoided.

According to the invention there is provided an earth mover of the kind referred to,

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characterised in that the vehicle engine and gear boxes and hydraulic pumps are arranged above the front axle of the vehicle, and that a sluable frame of the excavator carries a counter-weight and is arranged to be sluable about an upright axis above the vehicle wheels and approximately above the rear axle, and that operation control arrangements for the excavator and for the vehicle and for the said front implement are arranged on a floor plate fastened to the vehicle chassis and extending over the sluable excavator frame. Thereby there results an earth-mover such that the loading scoop or other front implement as well as the excavator can be fully utilised without requiring that either the excavator or the front implement must be dismounted in order to avoid a possible impaired manner of operation. There is also afforded an improved equalisation of the forces arising when the excavator is engaging the ground at a great distance from the centre of gravity of the vehicle, because the vehicle engine and the further driving elements lie above the front axle. The incorporation of the excavator in the construction of the vehicle and the provision of the excavator with a requisitely-compensating counterweight are advantageous for a unification of the driving control arrangements. For the rear excavator and the front implement the driver-operator may use a single sluable seat, whereby, besides the obviation of the changing-over, the operator's vision is improved during excavator operations. The incorporation of the excavator in the vehicle construction also offers favourable possibilities of arrangement for the driving control arrangement and for the excavator operation control arrangement, and in some circumstances changing from one seat to another can be avoided.

In a preferred earth-mover in accodance with the invention the vehicle is constructed as an articulated steerable vehicle with an upright articulation axis disposed centrally between the front and rear axles of the vehicle, and the engine is arranged on the front carriage and the excavator with a sluing mounting is arranged on the rear carriage of the vehicle. The steering by articulation affords the known advantage of a smaller turning circle of the vehicle and a good manoeuvrability in restricted spaces.

The said floor plate preferably rests upon a central support bearing. The operation control arrangement for the vehicle and the excavator may be disposed so that a forwardly-directed switch console for the vehicle and front implement, as well as a rearwardly-directed switch console for the excavator, can be operated by one person on a sluable seat turnable through 180°. The excavator switch console in another example of embodiment can be arranged to slue above the floor plate in common with the seat and with the excavator frame.

The invention is defined in the Claims hereinafter and how it may be performed is further explained hereinafter with reference to two examples of embodiment illustrated in the accompanying drawings, in which diagrammatically there are shown:—

Fig. 1 a side view of an earth mover in accordance with the invention,

Fig. 2 a plan view corresponding to Figure 1, and

Fig. 3 a side view of a second earth mover.

The articulated steerable vehicle in the example according to Figures 1 and 2 consists of a front carriage 2 and a rear carriage 3 which are pivotably and steerably connected to one another by an upright articulation axis 6 exactly in the middle between the front axle 4 and the rear axle 5. On the front carriage 2 is a driving engine with flanged-on gearboxes and hydraulic pumps for the various working implements provided on the vehicle. The front axle 4 is constructed as a non-steerable rigid axle, whilst the likewise driven and non-steerable rear driving axle 5 is mounted in a flexible bearing 7 for swinging on the rear carriage 3.

A front implement in the form of a loading scoop 8, indicated diagrammatically, is attached by linkage to the front carriage 2 as in the conventional manner of constructing front loaders. Because of the rigid front axle 4 and the weight loading by the engine and gear boxes as well as the fuel tanks and hydraulic tanks which are on the front carriage 2, this front loader has good levelling and loading characteristics. Approximately above the rear axle 5 on the chassis 9 is arranged a sluing mounting 10, which carries a sluable excavating frame 11 which carries a counter-weight 12 and is sluable through about 250° (see Figure 2). The limitation of the range X of the excavator sluability to 250° is required by the manner of construction primarily because over the sluable excavator frame 11 extends a stationary floor plate 14 on which are assembled operation control arrangement 15 for the vehicle and the front implement and an excavator operation control arrangement 16. An upright extension 17 on the chassis 9 of the rear carriage 3 is therefore required for supporting the floor plate 14 and this limits the excavator sluing range.

In the example of embodiment according to Figure 1 and 2 the floor plate 14 has at the axis of the excavator frame 11 a bore through which there extends upwardly from a supporting bearing 13 for the floor plate 14 a through-guide 18 (Figure 2) for the excavator hydraulic system conduits. A seat 19 sluable or lockable as required and the excavator operating control console 16 are fastened on the floor plate 14 so that therefrom a jib 20 linked to the excavator frame 11 with

shovel stem 21 and shovel 22 can be observed well.

In the illustrated rest position of the excavator, in which the jib 20 lies in the longitudinal axis of the vehicle, the seat 19 attached by links at 23 can be slued through 180° so that it assumes the position indicated with broken lines in Figure 1 pointing towards the steering wheel 24 and travelling control console 15. Instead of the illustrated operation control arrangements 15, 16 in Figure 1 there is basically possible also an arrangement such that the seat and the excavator operation control console are sluable together with the frame 11. In this case the control conduits extend from the switching console 16 to the excavator through the hollow support pillar or guide 18, and not as hitherto usual in built-on excavators from the switching console above the sluing axis to the individual hydraulic cylinders at the jib and shovel stem.

In the embodiment according to Figure 3, on a vehicle with a through-going chassis 25 the engine is mounted above the front axle, and the frame 11 of a sluable shovel excavator is mounted above the vehicle wheels in the region of the rear axle to be sluable about a vertical sluing axis. By way of difference from the manner of construction according to Figure 1, here the excavator sluing axis is displaced from the position directly over the rear axle somewhat further towards the rear, so that having regard to the compensating counter-weight 12 there is still afforded space for a wider longer extension or support portion 26 which through the floor plate 27 gives a stable bearing of the sluing shaft, suitably in a fork with the bearing shells 28, 29. The excavator frame 11, partially covered over by the floor plate 27, is introduced during the construction of the vehicle and there are achieved the same advantages as hereinbefore described.

In this embodiment also for both the operation control arrangements there is necessary only one seat, which is lockably pivoted about the shaft 23. A further possibility here consists in that from the excavator sluing shaft, for example through a chain transmission, motion can be transmitted to a shaft mounted vertically on the floor plate 27, which latter shaft carries the excavator operational control console including the sluing seat. On the basis of the selected transmission then for example from the illustrated rest position the excavator operation control arrangement follows the actual excavator sluing angle but nevertheless ensures that the operator can have a good view of the excavator. From the rest position the support legs 30 are retracted and stowed and then the seat is slued through 180° into position for the driver to operate the operation control arrangements and steering wheel for the vehicle.

WHAT WE CLAIM IS:—

1. An earth-mover of the kind consisting of an engine-powered vehicle with at least two axles, a front implement, (for example a loading scoop or grading or levelling device) attached by linkage at the front end of the vehicle, and an excavator mounted sluably at the rear of the vehicle, characterised in that the vehicle engine and gear boxes and hydraulic pumps are arranged above the front axle of the vehicle, and that a sluable frame of the excavator carries a counter-weight and is arranged to be sluable about an upright axis above the vehicle wheels and approximately over the rear axle, and that operation control arrangements for the excavator and for the vehicle and for the said front implement are arranged on a floor plate fastened to the vehicle chassis and extending over the sluable excavator frame.

2. An earth-mover according to Claim 1, characterised in that the vehicle comprises a front carriage and a rear carriage, and the engine is arranged on the front carriage, and the excavator with a sluing mounting is arranged on the rear carriage, and the vehicle is constructed as an articulated steerable vehicle with a upright articulation axis disposed centrally between the front and rear axles of the vehicle.

3. An earth-mover according to Claim 2, characterised in that the said floor plate rests upon a central support bearing for the sluable frame of the excavator.

4. An earth-mover according to Claim 1, characterised in that the vehicle is provided with a non-steerable rigid front axle.

5. An earth-mover of the kind referred to, constructed and arranged substantially as hereinbefore described with reference to and as illustrated in Figures 1 and 2 or Figure 3 of the accompanying drawings.

HANS & DANIELSSON,
Chartered Patent Agents,
32, Lodge Lane,
London, N.12.

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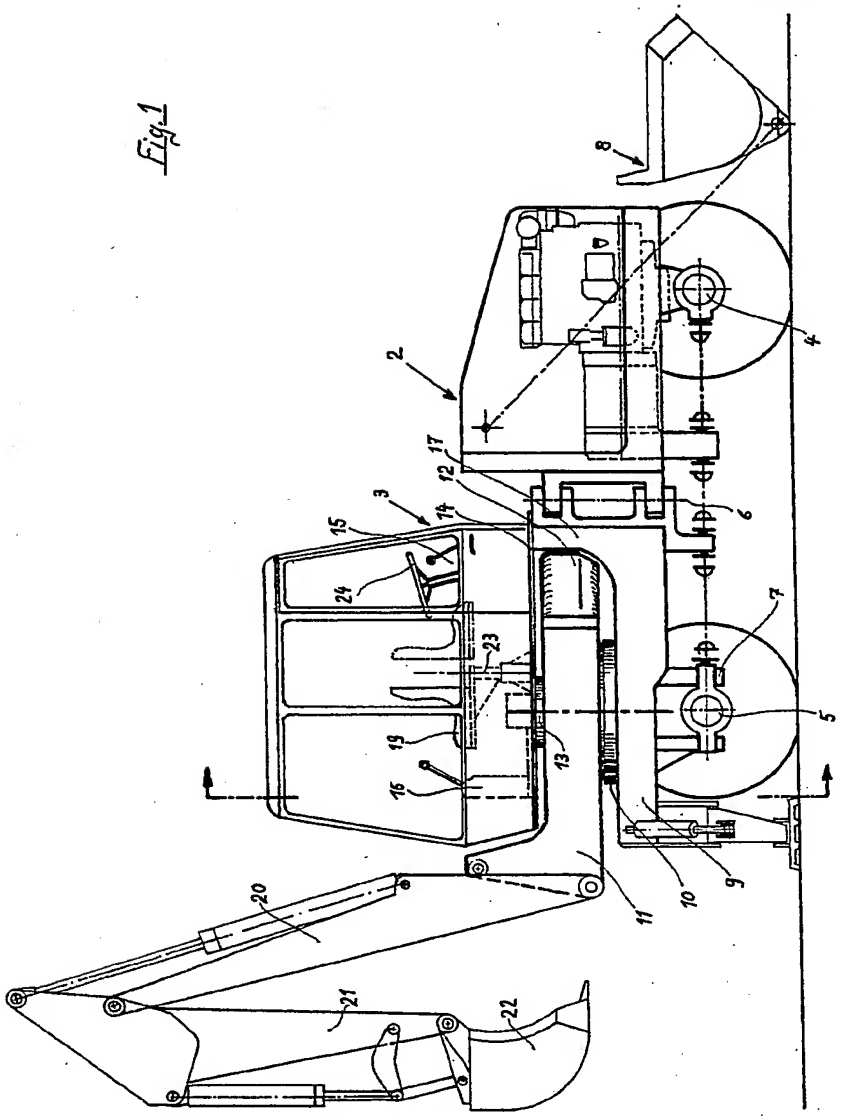
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

Fig.1



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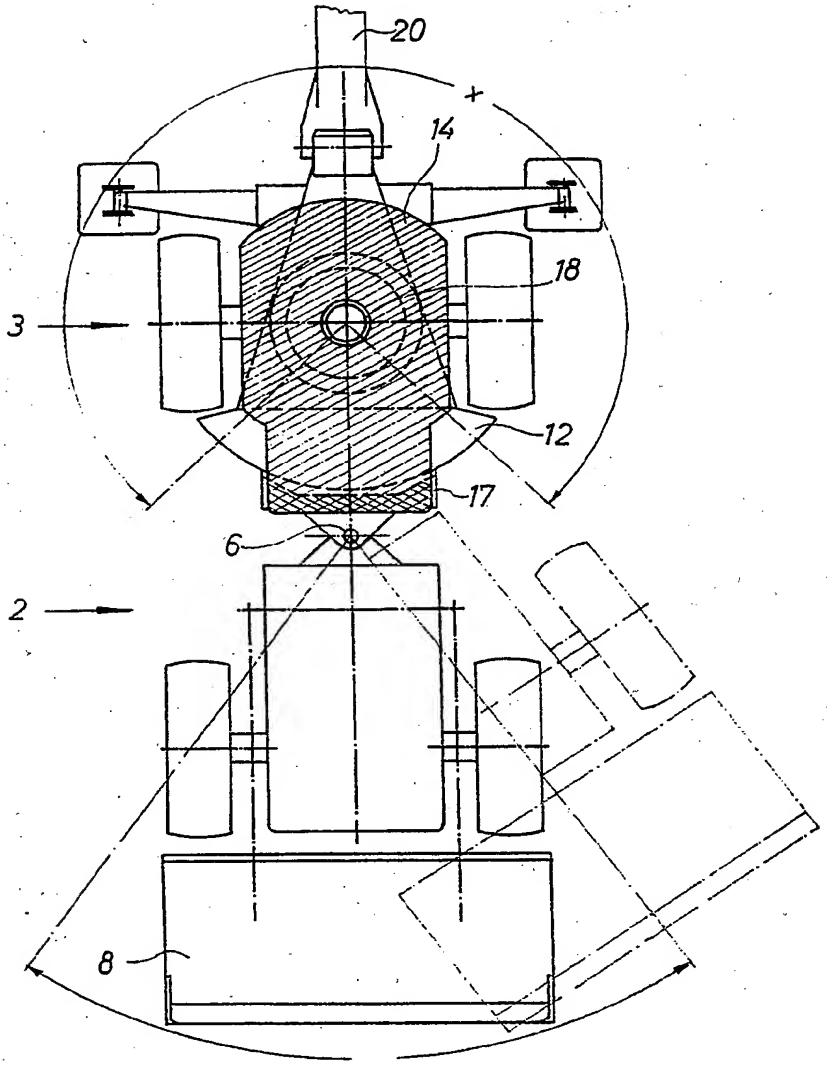

Fig. 2

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Sheet 3

Fig. 3